



The R&T Connection

A Publication of the United States (U.S.) Army Edgewood Chemical Biological Center (ECBC)
Research & Technology Directorate (R&T)

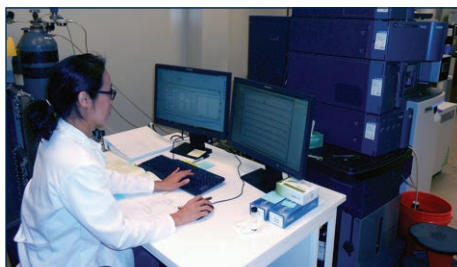
Issue 4 - Fall 2017



R&T Scientists Enable Future Army Forces with New Technology

Also inside:

ECBC Research Chemist Receives 2017
Baltimore Federal Executive Board
(BFEB) Award



UMBC President Wraps Up ECBC
Anniversary Speaker Series



ECBC Welcomes Boots in the Laboratory



U.S. ARMY
R&DECOM

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Director's Dialogue

R&T Team,

As the year goes on and we continue to leverage our institutional excellence to ensure our customers successes, I am reminded of the many assets we have here at R&T. In this edition of the R&T Connection you will learn about some of the capabilities we have to offer, and the opportunity to meet some of your colleagues in the Employee Spotlight section on page 14. From the bench-level researchers to the priceless information within our Technical Library, our workforce is equipped to support the warfighters defending our nation. One hundred years of knowledge exists within the R&T Directorate and leveraging this knowledge allows us to successfully fulfill our mission.



To position ourselves for the next 100 years, this summer we stood up the R&T Strategic Council. This council was representative of a broad base of employees across the R&T community, and had the purpose of providing a framework to define and communicate the mission, vision, and values of the organization, and to establish an overarching strategy to guide the future of our directorate. A priorities roadmap was identified with the following objectives:

- Streamline Internal Contracting Processes
- Showcase R&T's Capabilities to Customers and Collaborators
- Promote Workforce Developments and Exchange Opportunities
- Expand R&T's Access to Scientific Research, Literature and Data Products
- Enable Efficient and Effective Communication across the Directorate
- Establish a Path to Success for R&T's Acting Leadership

These objectives will shape decisions made across R&T and are vital to the growth and support of the workforce goals at the Center level.

Furthermore, I would like to acknowledge and thank the employees who were members of the R&T Council. They set aside time from their busy summers to participate in seven half-day workshops. Their names are:

- | | |
|---|---|
| • Patrice Abercrombie-Thomas
<i>Chemical Sciences Division</i> | • Sofi Ibrahim
<i>BioSciences Division</i> |
| • Tim Allan
<i>Chemical Sciences Division</i> | • Steven Lagan
<i>Physical Sciences Division</i> |
| • Russell Bartholomew
<i>BioTesting Division</i> | • Dave McGarvey
<i>Toxicology and Obscurants Division</i> |
| • Brian Bennett
<i>BioTesting Division</i> | • Amber Prugh
<i>BioSciences Division</i> |
| • Jerry Cabalo
<i>Physical Sciences Division</i> | • Amanda Schenning
<i>CB Protection and Decontamination Division</i> |
| • Shawn Debow
<i>Toxicology and Obscurants Division</i> | • Bryan Schindler
<i>CB Protection and Decontamination Division</i> |

**Please see the full R&T strategic framework on the back cover*

I would also like to thank each and every one of you for your attention to the mandatory training requirements this year, as we completed greater than 99 percent of this years' required training. This training may be tedious, but your dedication to its completion continues to showcase your enduring commitment to the betterment of the Army.

I hope you enjoy this edition of the newsletter and you take time to learn more about your colleagues and their innovative work.

Fred Berg, Ph.D.

POSTDOCTORAL RESEARCHERS BRING CUTTING-EDGE SCIENCE AND TECHNOLOGY TO ECBC

ECBC is comprised of highly skilled scientists from across the U.S. As the Army's premier center for chemical and biological agent research, ECBC must develop the next generation of young scientists to continue to be at the forefront of experimental research, technology, and success.

In a recent study¹ from the Organization for Economic Cooperation and Development, the U.S. is ranked number 38 of the 40

most advanced countries when it comes to graduating science majors. To do its part, ECBC offers 29 active opportunities for postdoctoral students and 19 advisors through the National Research Council (NRC) and the Oak Ridge Institute for Science and Education (ORISE) programs. The NRC conducts the Research Associateships Program in cooperation with sponsoring federal laboratories

and research organizations approved for participation. The ORISE postdoctoral research fellowship program promotes excellence in scientific and technical research and advanced training for highly-qualified scientists who have completed their Ph.D. in a science-related discipline by funding these individuals as they pursue research careers in Federal laboratories.

FAST FACTS

ORISE

- Nationally comprised of 55,000 faculty and students
- Administers more than 150 science education programs on behalf of U.S. federal agencies
- Provides access to premier scientific user facilities and large-scale, multidisciplinary research programs

NRC

- The NRC administers competitive graduate, postdoctoral and senior research awards on behalf of 26 U.S. federal research agencies and affiliated institutions with facilities at over 100 locations throughout the U.S. and abroad
- Research associates receive annual stipends from the NRC ranging from \$42,000 to \$80,000 for recent Ph.D. recipients and are proportionally higher for senior associates
- Graduate entry level stipends begin at \$30,000 and are higher for additional experience

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Drew Desilver. U.S. Students' Academic Achievement Still Lags of Their Peers in Many Other Countries (Pew Research Center: 2017)

Generally, postdoctoral researchers have the freedom to explore what they desire within the mission programs of their branch, as well as a few smaller programs at ECBC. However, to join teams working on more specific projects, NRC fellows are required to submit an extensive package for approval.

After completing the postdoctoral program, professionals have a wide range of career opportunities to choose from. Some aspire to eventually be hired as a career government researcher, a college professor or become a member of the private sector.

The postdoctoral program is a reputable way to recruit new, young and motivated scientists for ECBC research programs. They deliver the latest technologies from rigorous institutions with cutting-edge science to solve chemical and biological defense threats to our nation.

Below is more information about some of the postdoctoral employees at R&T.



Elizabeth Dhummakupt, is studying chemistry and supports the BioDefense Branch as a participant in the NRC program.

“What has surprised me the most about my postdoctoral experience at ECBC is the amount of different people I have been able to interact with – from researchers in other divisions and branches to different funders. I am being exposed to the whole process of how research is done at ECBC, from pitching ideas and securing funding, to building collaborations and seeing work completed with reports and manuscripts.”



Monica McEntee studies physical chemistry and supports the Chemical, Biological and Radiological (CBR) Filtration Branch. While working at ECBC, Monica has built a versatile chamber that has a wide pressure range from high vacuum to atmospheric conditions, wide temperature range, and can study gases, vapors, and aerosols using surface spectroscopy techniques. Monica has also worked on projects characterizing advanced materials for filtrations in filters, and understanding the environmental impacts of aerosols deposited onto environmental surfaces.

“Since surface chemistry is based off very basic chemical properties, I believe the knowledge I have learned while I have been part of the postdoctoral program can be applied to any field of research.”



Jason Navin studies chemistry and supports the CBR Filtration Branch. Jason is a part of the NRC program. The goal of Jason's research is to investigate the destruction of chemical warfare agents via oxidation by means of reactive oxygen species generated from advanced metal oxide materials.

"As postdoctoral researchers at ECBC, we are given a fair amount of freedom in determining the direction of our research and our input on scientific matters can impact our work. I believe that being well-versed in a variety of analytical techniques allows one to more efficiently solve problems in any research field."



Trent Tovar is studying chemical engineering and supports the CBR Filtration Branch, as part of the NRC program. Trent decided to study adsorption in graduate school since it is a fundamental aspect of chemical engineering with applicability across a wide range of industries.

"My studies include trying to increase the lifetime of self-contained breathing apparatuses (SCBA) by enhancing the quantity of oxygen a tank can hold by using absorbents. Since the SCBAs do not rely on an outside oxygen source, they can provide universal respiratory protection which could potentially replace gas masks."



Brian Hauck studies analytical chemistry and supports the Detection Spectrometry Branch as part of the NRC program. Brian chose to pursue a Ph.D. in analytical chemistry after he gained experience researching and working with ion mobility spectrometry. His interest and attention was captured by the technology and he wanted to learn more about the application.

"The challenge I am trying to address is the reduction of false alarm rates in threat detection technology. This will help keep warfighters safe from threats by avoiding false negative responses on the battlefield and help prevent wasting resources by avoiding false positive alarms."



IMPROVED ECBC TECHNICAL

The Library Now Offers More Research Capabilities for ECBC

The scientific method is only as good as the analysis behind it. As threats change and evolve, applied science has a tremendous effect on how we protect ourselves from our adversaries. Current research has and will continue to lay the foundation for the defense of tomorrow. The R&T Technical Library has access to hundreds of thousands of pages of scientific analysis. This information allows R&T customers, warfighters and the DoD community the ability to leverage this knowledge via R&T research. This advantage provides mission critical information to discovering revolutionary means of protecting warfighters in real time on the frontlines.

The Technical Library, located on Aberdeen Proving Ground, Edgewood Area, offers a full range of traditional and digital library resources to support ECBC personnel and facilitate the Center's research.

WebCat, the library's online catalog, allows users to search the collection and locate

items of interest. Additional research databases such as Web of Science, EndNote Web and SciFinder are also made available by the library.

"Having access to a vast amount of information is critical when developing the next generation of scientific and technological innovations to enable warfighters to protect and defend our Nation and its allies," noted Michael Ellzy, Ph.D., acting chief of the Chemical Sciences Division. "I have worked with the library staff on several occasions and their knowledge and insight on information available has allowed for creative and adaptable solutions enabling researchers to leverage their unique expertise fueled by research."

Over the past two years the library has added several new resources that ECBC employees have access to. These resources include 10 additional journals including titles such as Biosensors and Bioelectronics, Toxicology Sciences, Inhalation Toxicology and access to over 1,500 eBooks on the

eBary, which is now the online eBook Central platform.

Previously, if an employee requested items not within the Technical Library collection it took weeks if not months before the library staff could obtain those items. Now, the Technical Library can arrange for on-demand access to unsubscribed content from publishers such as Elsevier, Wiley and Nature, all of which are providers of scientific, technical and medical information.

Services provided by the library now include ECBC authorized articles, and this information is distributed to the workforce on a semi-annual basis.

The Technical Library continues to enhance access to technical reports that scientists and researchers refer to in crisis situations and provides vast resources to greater protect the Warfighter. ECBC employees are highly encouraged to use the library to expand their scientific research and literature. 🌱

For a more in-depth description of library services and links to library resources visit the library's homepage:
<https://cbconnect.apgea.army.mil/DPI/bp/TechLibrary/default.aspx>

To schedule a training session, request a literature search, or to obtain library related materials, contact the library staff:

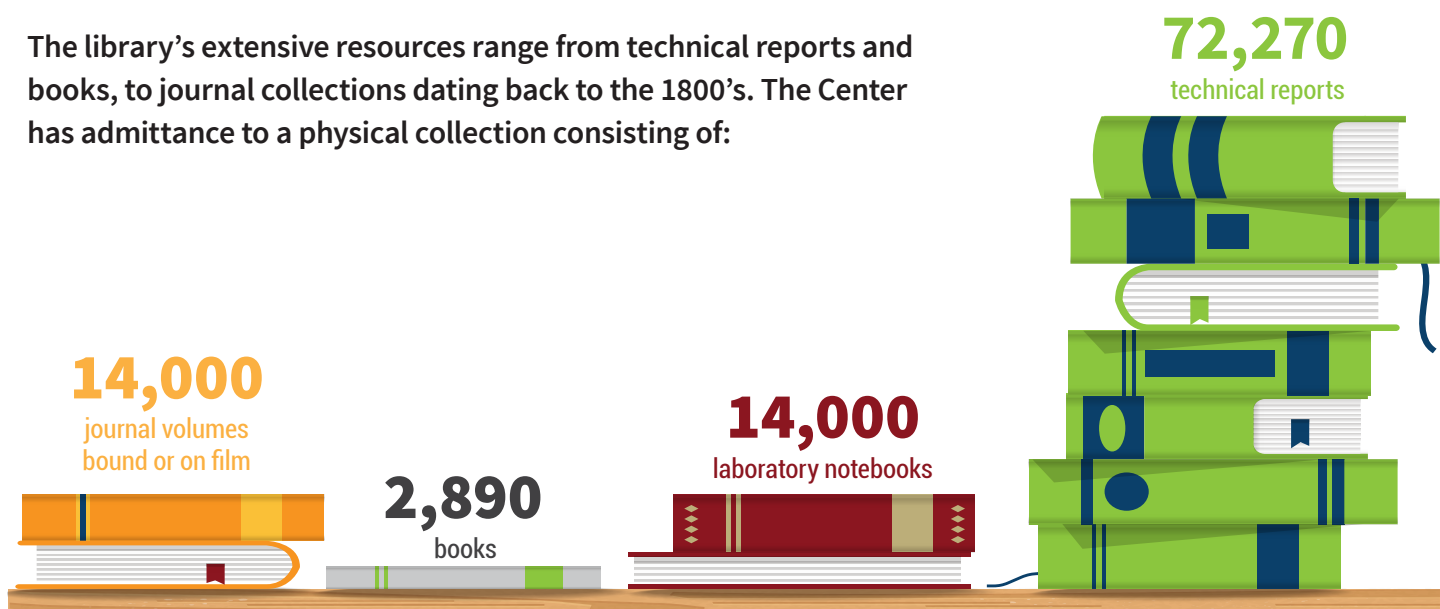
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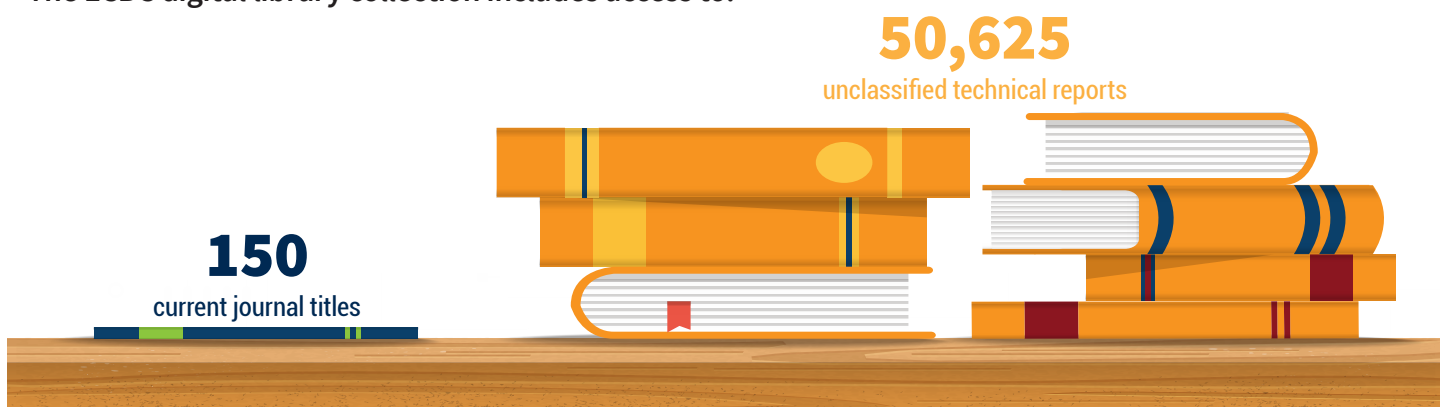
The R&T Technical Library has access to hundreds of thousands of pages of scientific analysis.

LIBRARY

The library's extensive resources range from technical reports and books, to journal collections dating back to the 1800's. The Center has admittance to a physical collection consisting of:



The ECBC digital library collection includes access to:





U.S. Army Soldier displays the MANO to showcase ease of use requiring only one hand and a clear outside bag to protect sample integrity.

R&T SCIENTISTS ENABLE FUTURE ARMY FORCES WITH NEW TECHNOLOGY

Following the 2001 bioterrorism anthrax attacks the Army deployed several iterations of sampling devices arrayed to detect contamination on surfaces during rapid biological identification missions. 16 years later, a new era of warfare is evolving and the need for rapid identification of chemical and biological agents is necessary to prevent and deter incidents. Conditions in hazardous environments such as these, and many others, are ever-changing. The ability to control risks within these situations allows warfighters to have a competitive edge against adversaries and other potential dangers. Rapid biological identification missions are habitually atypical and the technologies used within these missions must be flexible, to ensure a successful completion and safe return of the warfighter.

The Army mission, to be adaptable and at an operationalized stance of readiness, is always at the forefront of ECBC scientist's purview. Researchers at ECBC have assessed the risks of Soldiers who wear mission oriented protective posture gear and have designed a new sampling device to facilitate biological sampling using one hand. The


Mano Sampling Device (MANO), also known in the Spanish language as "hand," has a rugged ergonomic design. MANO allows for a quicker response time and an overall reduction in waste compared to the current DoD Biological Sampling Kit (BiSKit), which was also developed at ECBC over a decade ago. The BiSKit requires two hands for use and can require up to ten minutes to acquire a biological sample.

"It is vital the warfighters are not left vulnerable in the field for extended periods of time. When collecting these specimens, there are several external factors which can negatively affect the mission. With the warfighter in mind we created the MANO and brought the sampling time from ten minutes down to three minutes," said Daniel Angelini, Ph.D., of the R&T Biodefense Branch. "The current operation requires up to three people to complete. One person to sample, one person to carry the samples and one person to record the location of the collection site. Enabling the warfighter to use the MANO with one hand and in three minutes allows for a quicker response time and only risks two warfighters in the

uncertain environment," Angelini noted.


The MANO design also cuts down on generation of waste compared to the BiSKit and in turn costs less to manufacture and maintain. The design also allows the MANO to act as the sampler as well as the transport packaging. As shown in the photo, the sampler comes inside a clear bag, which is then folded back to allow the user to hold it with one hand. Then the sample is collected via the yellow sponge and the bag is folded back over the specimen and zipped shut. This process protects the integrity of the sample and the MANO is exceptionally useful when the need arises to acquire multiple samples as the risk for cross-contamination is very low.

The MANO device can collect a *Bacillus anthracis* simulant with greater efficiency than the BiSKit device as a result of its design, noted in ECBC Technical Report 1367. These results allowed for further studying to take place to create a baseline for allowing the MANO to be incorporated into regular field use. 🌱



Researchers at ECBC have assessed the risks of Soldiers who wear mission oriented protective posture gear and have designed a new sampling device to facilitate biological sampling using one hand.

U.S. Army Soldier seen using the MANO device in the field to collect a specimen.



Sue Bae, Ph.D., Research Chemist, evaluates scientific data.

ECBC RESEARCH CHEMIST RECEIVES 2017 BFEB AWARD

Sue Bae, Ph.D., received the BFEB, Excellence in Federal Career Award for 2017. This prestigious program honors outstanding federal employees who have exceptional and meritorious work ethic throughout their career and those who exceed the high standards of performance in the federal government. The role of the 28 Federal Executive Board (FEB) network is to create value to the public by fostering collaboration, communication, and coordination among federal, state and local government agencies. This regional awards program is in addition to individual departmental or agency awards programs.

Bae was nominated by Steven Harvey, Ph.D., and selected as the Silver Winner of the 2017 BFEB, Excellence in Federal Career Awards in Category 2A (Outstanding Professional [Non-Supervisory] – Technical, Scientific and Program Support). Those considered for the award include other permanent, career civilian employees of the federal government as well as military personnel. All those nominated must be employed by a FEB member agency or installation in Maryland.

Bae joined ECBC as a research chemist in 2003 and has been a significant contributor to ECBC's analytical method developments over the past 14 years. Her

main accomplishments include developing a method for the decontamination of excess riot control agent, an approach now used at U.S. embassies around the world in addition to the development of liquid chromatography-mass spectrometry procedures for determining the potential presence of chemical nerve agent in various food matrices. This Liquid Chromatography-Mass Spectrometry work was done in support of the U.S. Department of Agriculture effort to ensure the safety of school lunches. Additionally, Bae developed the first series of molecularly imprinted polymers (MIPs) using chemical nerve agents as the template molecules. These MIPs were uniquely suited for applications in chemical separations and molecular sensing of nerve agent molecules in various matrices, where they are currently in use.

"I was very surprised and extremely honored to be chosen as the recipient of this award," said Bae. "Winning a Silver Award means I have been acknowledged by my peers as being among the top research chemists in ECBC. It is very affirming and serves to make me want to do an even better job."

While accomplishing major scientific breakthroughs, Bae also heavily focuses on teamwork in her division by mentoring students in her field. As a mentor, she

has identified numerous developmental opportunities for her co-workers and has helped shape young scientists career paths.

"Dr. Bae made a huge impact on my career in my short visit to ECBC. While not having official responsibility for my work, Dr. Bae took it upon herself to help teach me analytical techniques that I would not have been exposed to," noted Grant Hall, student mentee.

"As a chemist, communication amongst colleagues is a critical component of becoming a successful scientist," Bae noted.

Looking ahead, Bae aims to continue to make an impact on the Nation through practicing analytical chemistry. In terms of her career, she is focused on the present, and plans to continue discovering new ways to support the Army mission by focusing not only on internal collaborations, but also capitalizing on external collaborations with universities and departments across the world. It is crucial for the warfighters to be able to rely on only the best scientists and chemists at ECBC as they work to keep the nation and the world safe from chemical and biological threats. 🌱

A photograph of Dr. Freeman Hrabowski, a man with glasses wearing a dark suit and a yellow patterned tie, speaking and gesturing with his hands. He is in a room with several black chairs and a black metal railing in the background. Another person is partially visible on the right, listening.

UMBC PRESIDENT WRAPS UP ECBC ANNIVERSARY SPEAKER SERIES

Dr. Freeman Hrabowski speaking to a group of ECBC workers.

University of Maryland, Baltimore County (UMBC) President Freeman A. Hrabowski, III, Ph.D., spoke to ECBC employees Oct. 11 during the last event of the Center's 100th Anniversary Speaker Series

Named one of TIME Magazine's "100 Most Influential People in the World" in 2012, Hrabowski is recognized worldwide for cultivating innovation in education at UMBC. Since he became UMBC president in 1992, Hrabowski has transformed the reputation of UMBC from a commuter and sister school to the University of Maryland, College Park, to a university nationally recognized for its academic innovation. UMBC was named in the 2018 U.S. News & World Report college guide as the seventh most innovative university in the nation and is tied with Duke University, the University of California-Berkeley, the University of Chicago and the University of Notre Dame as a top university for undergraduate teaching.

In his talk at ECBC titled, "Grassroots Innovation: The Power of Your Power," Hrabowski spoke about how diversity, collaboration, and grit are keys to guiding innovation, enduring challenges, and encouraging ingenuity. Innovation is one of ECBC's strategic goals as an organization. With a mission of being the nation's premier provider of innovative chemical and biological solutions, the Center strives for the development of new products and

solutions to protect U.S. forces and citizens. "Innovation is the key to staying ahead of future defense needs," said ECBC Associate Director Michelle Goddard. "Dr. Hrabowski's lessons can enhance ECBC employee's ability to be creative and identify unique ways to solve complex defense problems."

Hrabowski engaged the audience with a series of what he described as uncomfortable questions, such as inquiries about minority education and participation experiences with Hispanic, African-American and Asian communities in America versus Caucasians of all socio-economic backgrounds. He went on to link the facts to the ways in which UMBC has pioneered the journey to recognize and recruit the underrepresented population of students to their school. UMBC has students from more than 100 different countries.

Hrabowski discussed the importance of being open to risk in the innovation process. Throughout his conversation with the audience he linked risk averseness to innovation and stated, "There is no way to talk about innovation if we do not talk about creating a climate that allows people to take risks."

Hrabowski explained that UMBC defines innovation as finding more ways to work in groups and to collaborate and partner with industry, colleges and governments in order to rethink the way in which business is done. Hrabowski continued to suggest innovation also means changing the way in which we use the word "smart." Rather than dubbing one group to be smarter than another, he encouraged the audience to focus on those with the drive and grit to succeed and achieve at any desired level. According to Hrabowski, true grit, which also happens to be the name of the UMBC Chesapeake Bay Retriever mascot, is having the personal characteristics of hard work and resiliency.

Through Hrabowski's experiences with grit, innovation and education, he has created an educational environment at UMBC which encourages people to step outside of their comfort zones and to ask questions. He challenged the ECBC audience in the spirit of innovation to ask questions, because this questioning, according to Hrabowski, is what creates an environment that inspires others to critically think and therefore supports the next era of visionaries. 🌱



ECBC WELCOMES BOOTS IN THE

A Hands-on Laboratory Exercise Brings Warfighters Together with R&T Scientists, Engineers, and Technicians to Optimize Chemical, Biological, Radiological and Nuclear (CBRNE) Defense Solutions

During an immersive 2 ½ days, five U.S. Marines from the Chemical Biological Incident Response Force (CBIRF) and a U.S. Army Soldier from the 20th Infantry Regiment, Fort Irwin, California participated in a “Boots in the Laboratory” non-surety experience at ECBC. The goal of was to enable the warfighters to garner an understanding of how CBRNE defense for mission critical solutions in the field are born out of the laboratory. Sponsored by Defense Threat Reduction Agency (DTRA) Joint Science and Technology Office (JSTO) in partnership with the U.S. Army 20th CBRNE Command, this opportunity allowed warfighters to discuss interests, ask questions, and learn about research as it relates to the chemical and biological defense systems they are operating in the field.

CBIRF Sergeant Devon Woycke, who participated in the program, noted, “This was such a monumental and eye-opening experience. Prior to my visit to ECBC, I had no idea of the scale of the CBRNE Defense enterprise. As Marines, all of our focus is on the operating forces; the staff at ECBC was extremely approachable and the wealth of knowledge among them was extensive. With every workspace we went to, R&T staff made it clear to us we could reach back to them at any time. This kind of support is invaluable.”

During “Boots in the Laboratory,” participants received a safety and protection overview, which consisted of a tour of ECBC’s forensics laboratory, a presentation of the Big Mac II which

enables R&T to conduct in-depth toxicology research and testing on a larger scale, and a demonstration on how to properly fit a gas mask.

“The benefits of having both Marines and Soldiers in the labs is unprecedented,” CBIRF Staff Sergeant Seth Densford reflected, “Seeing what goes on in the laboratory gives a lot of credibility to the equipment and tactics we use every day. I was blown away by the expertise and resources available. This is clearly a relationship we need to continue to cultivate.”

The participants received an opportunity to walk through prototype systems researchers are currently working on and



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- CBIRF Staff Sergeant Seth Densford

LABORATORY

witnessed a National Guard Civil Support team chemical/biological training class lead by Carrie Poore, Ph.D., acting chief of the Advanced CBRNE Branch.

The end state of these partnerships encourages an understanding of how work in the laboratory translates in theater and how field experiences influence the creation of enhanced capabilities for warfighters; this in turn operationalizes the warfighter's state of readiness in globally unstable environments. The research and development of CBRNE tools at ECBC allows warfighters to not only defend themselves but it enables them to protect against and neutralize threats worldwide. These scientist and Warfighter information sharing alliances continue to further R&T's purpose of preparing Soldiers to protect our country, near and far, from chemical and biological warfare agents. Looking ahead, ECBC aims to host another “Boots in the Laboratory” experience open to troops from all branches of the armed forces.

This partnership is a continuation of a program ECBC participated in last year; in 2016, ten ECBC employees partook in the Scientists in the Foxhole (SITF) program, also created and sponsored by DTRA JSTO. These types of operations embed scientists, engineers, and troops together in the field. Those who research and develop non-medical chemical and biological defense technologies engage in exercises with the warfighters. These collaborations are unprecedented and empower warfighters to achieve their missions with confidence in the science behind their capabilities.

“We were able to see the benefits of these programs first-hand,” noted Frederick Cox, Ph.D., deputy director of R&T. “Information sharing through the SITF and other programs gives our researchers access to those who will deploy their technologies. When asked if we wanted to participate in reciprocating the program we saw it as an opportunity to continue to learn with the warfighters. Ultimately these efforts

assist in our mission to enhance warfighter capabilities and enable their readiness against chemical and biological hazards.”

SITF fosters innovation and forward thinking to stimulate research efforts to benefit the future force of the warfighter. In 2016, ECBC researchers also participated in Scientists in the Sand, Scientists in the Flight Line, and Scientists at Sea. Each of these programs are unique to the service, and give scientists and engineers the chance to live a week in the life of a Sailor, Soldier, Marine, and Airman.

Amy Maxwell, chief of the Chemical and Biological Protection and Decontamination Branch, noted, “In general, I think strengthening this partnership would be beneficial not just for ECBC, but for all research development and engineering commands.” 🌱

EMPLOYEE SPOTLIGHTS

Each edition of the R&T Connection will contain a spotlight on a member or members of the R&T team. The spotlight encapsulates a sneak peek into the minds of those behind the research and development of technological solutions to solve chemical and biological defense threats to our nation. This month's Employee Spotlight features two employees, Vikki Henderson, a physical science technician in the Agent Chemistry Branch and Shawn Stevenson, a chemist in the Decontamination Sciences Branch and CB Protection and Decontamination Division.



Vikki Henderson

Physical science technician in the Agent Chemistry Branch

Q: What is your background with ECBC and what other positions have you held?

A: I began my career at ECBC as a 19-year-old private in the Army. I ended my military career at the rank of SP5 (E5) with seven years of service. I knew there was nothing else I wanted to do except be a chemical laboratory technician, so I decided to leave the military.

I have worked in several different areas of research, all involving work with chemical agents in some capacity. As a Soldier, I conducted charcoal breakthrough testing using toxic agents, worked with a behavioral toxicologist who studied the impact of toxic agents on the learned and learning behavior of rats, and conducted analytical testing of known and unknown samples.

As a technician II, I worked with chemists and studied ways to detect to chemical agent and toxic substances. We also tried our hand at developing self-decontaminating coatings and charcoal bed filter-life indicators. Working as a physical science technician, I spent most of my career working on agent decontamination projects, such as alternative technologies, small scale reactor studies and material testing.

For the past eight years, I have worked on the Agent Chemistry Branch learning NMR and researching agent fate.

Q: What is your current role within the R&T Team?

A: I have been learning how to use an NMR-MOUSE (Mobile Universal Surface Explorer) for the past six months. Basically, it is a portable, single-sided NMR. This is a new research tool for non-destructive sample characterization and I am very excited about the possibilities.

Q: What inspired you to have a career in math and science?

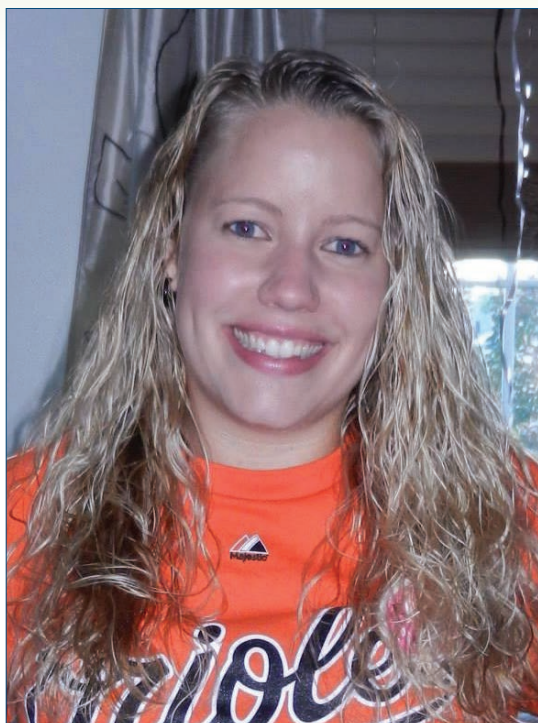
A: Math has always come easy to me, not so much the chemistry. Although, I have a curiosity about things and that has inspired my interest.

I also take pride in knowing that the work I have done over the years has had a direct impact on the safety of Soldiers in the field or other employees within ECBC.

Q: What is a little-known fact you'd like to share?

A: Six years ago, I donated a kidney to a family member.

Exceptional organizations have purpose driven people at their core, working day in and day out to assist in fulfilling a mission and vision. R&T is extremely fortunate to have many amazing teammates, all working to bring operationalized solutions to our Army, our customers and our warfighters.



Shawn Stevenson

Chemist in the Decontamination Sciences Branch

Q: What is our background with ECBC and have you held other positions?

A: I have been a chemist for the Decontamination Sciences Branch for the past eight years. After graduating from Towson University with a bachelor's degree in chemistry in 2008, I was hired as a contractor. I then converted to a government employee with ECBC in June 2010. As a new employee, I learned the tasks associated with the research and development of new technologies to the applied research level. I worked my way up to manager of a surety laboratory, where I was tasked with ECBC safety, surety, and security policies and made sure they were met during each agent operation.

Currently, I am the primary investigator on multiple programs for the branch in which I work with outside organizations to plan and execute research programs. In addition to my primary tasks as a chemist, I have been involved in other ECBC activities. I have helped plan and present at the annual Coffee with Colleagues and regularly participate in leadership trainings that are offered by the Center.

Q: What inspired you to become a chemist?

A: My junior year of high school was my first experience with chemistry. My teacher was extremely knowledgeable and made the class interesting. When it came to choosing a college major, chemistry made the most sense


for me. After graduating college, I knew I wanted to contribute to an organization that explored novel ideas and the outcome of work would be beneficial to others. My father has had a career as a government employee at Aberdeen Proving Ground, and so being aware of the work and the organization, I knew I wanted to be a part of it.

Q: What is an exciting project you have worked on at ECBC?

A: I was heavily involved in a program in which we were asked to develop a new method to accurately measure the chemical agent resistance of chemical agent resistant coating (CARC). In previous studies completed by the Decontamination Sciences Branch, it was discovered that CARC can absorb a significant quantity of agent, and thus, presents a significant decontamination challenge. In collaboration with the Army Research Laboratory, we developed a new method to determine the chemical agent resistance of CARC. During the program, I also coordinated a multi-laboratory validation of the new method involving ECBC and three other laboratories across the country. This validation study was one of the first of its kind in which all laboratories used neat chemical warfare agent.

Q: Do you have a little-known fact you'd like to share?

A: I am an avid Baltimore Orioles fan and in my free time enjoy playing video games with my husband. 🍷



ECBC researchers study terrestrial ecosystems to gap risks in environmental Warfighter solutions.

THE ARMY TAKES A PRO-ACTIVE STANCE ON ENVIRONMENTAL TOXICOLOGY

Scientists Study the Effects of Insensitive Munitions (IMs) in Terrestrial Ecosystems Developing Ecotoxicological Data to set Regulatory Standards

Scientists at ECBC have taken a hands-on approach to studying the effects of IMs for future weapon systems. Present munitions, RDX and TNT, which are over 70 years old, contain highly sensitive volatile compounds and can detonate in response to heat or shock. The need to develop and evaluate a new munition which is less sensitive to the elements has become a priority for the Army and critical for the safety of warfighters. Funding from the Strategic Environmental Research and Development Program has enabled the researchers in R&T to engage in an environmental toxicology information seeking mission. The researchers are working to address the terrestrial knowledge gap of potential risks in these innovative environmental warfighter solutions.

This mission, to develop ecotoxicological data for IMs, will ultimately derive risk-based regulatory levels for selected key soil ecological receptors. The project will study the toxicities, bioaccumulation, and bioconcentration of 2,4-dinitroanisole (DNAN) and 3-nitro-1,2,4-triazole-5-one (NTO). DNAN and NTO will be exposed in natural soil allowing for ideal absorption

circumstances and systemic circulation during these experiments. This natural habitat will mirror the weather and aging found in microenvironments in battle and testing fields.

“The studies are designed to meet regulatory requirements for developing ecological soil screening levels for use in screening-level ecological risk assessment, and species sensitivity distributions to determine specific hazardous concentrations of DNAN and NTO. These concentration levels will be used to assess potential risks for food chain transfer for each of the IMs, to high trophic level receptors,” remarked Roman Kuperman, Ph.D., lead principal investigator in the Molecular Toxicology Branch. These studies are encouraging because they showcase our ability to be good stewards of the environment. These IMs have the potential to be used in theater but also are heavily used in training missions in the U.S. Having the ability to determine the risks of these IMs and their ability to migrate to soil invertebrates and ground water is vital to the fielding of these munitions.”



Roman Kuperman, Ph.D., lead principal investigator in the Molecular Toxicology branch, evaluates IMs potential risks and determines hazardous concentrations of DNANA and NTO.

The toxicity standards established within this study will be transitioned to the U.S. Environmental Protection Agency for use as the source of risk-based regulatory levels. Results stemming from this research will also allow for the future costs of testing sites to decrease because the cleanup post-trial are scientifically calculated rather than estimated. 🌱

HIGHLIGHTS

- **Patricia Buckley**, Ph.D., of ECBC's BioTechnology Branch and Gary Voya, Ph.D., of the Naval Research Laboratories met with the Defense Advanced Research Projects Agency team and performers from eight different universities across the country 13-14 June 2017 to present the joint independent verification and validation effort for the BioControls program.
- **Members of the Chemical Biological Radiological (CBR) Filtration Branch** traveled to Natick, Massachusetts to attend a DTRA sponsored workshop entitled, "Functionalizing Fibers and Textiles Workshop." Gregory Peterson briefed ECBC's current role in developing novel multifunctional reactive materials to be used in suits and other commodity areas. On the second day, a MOF/Fiber Working Group meeting was held between ECBC, The U.S. Army Natick Soldier Research, Development and Engineering Center, and several universities, including Northwestern, NC State, UC San Diego, SUNY Binghamton, and South Alabama. The objective of this meeting, which occurs semi-annually, is to provide a collaborative atmosphere between university partners such that common goals can be targeted and achieved for maturing novel multifunctional materials.
- **ECBC presented at the Military Operations Research Society Symposium** at the U.S. Military Academy, West Point, NY. The presentation was titled "Using Quality Tools to Improve Data Collection during Layered Sensing Field Demonstrations" and was presented by Steven Lagan of Modeling, Simulation, and Analysis Branch. The presentation used ECBC's Layered Sensing approach as a case study to demonstrate the ways in which quality tools (such as process flow charts, failure modes and effects analysis, and mistake-proofing) can improve process design and yield quantifiable benefits.
- **Trevor Glaros**, Ph.D., and his colleagues from the BioDefense Branch were invited to present recent research at the Smithsonian Institute Museum Support Center. This meeting was established during the annual meeting of the American Society of Mass Spectrometry. The team presented their work on "Direct Analysis of Chemical Warfare Simulant Aerosol by Paper Spray Mass Spectrometry". This presentation concentrated on one application, air analysis, of the myriad of paper spray techniques developed at ECBC. Afterward, the BioDefense team met with Smithsonian researchers to discuss future research collaborations between the two facilities, including ECBC's ability to assist in analysis of military uniforms worn during different wars and conflicts.
- **ESEP scientist, Stuart Notman, Ph.D.**, from Defense Science and Technical Laboratory (UK), currently works with the ECBC Decontamination Sciences branch. On August 16, 2017, Notman shared his research findings connecting properties and decontamination with members of the Protection and Decontamination Division.
- **BioDefense Branch member, Vipin Rastogi, Ph.D.**, authored a manuscript, which was accepted for publication in Clinical Microbiology and Infectious Diseases in August 2017. The publication entitled "The sporicidal potency of bioxy formulations in decontaminating bio-warfare agents" was authored by Vipin Rastogi (ECBC), Lisa Smith (formerly ECBC, now with U.S. EPA), Garry Edgington (CBI Polymers, Inc.), Marwan Dagher, Dori Dagher, and Fadi Dagher (Bioxy AFD Inc., Quebec, CA). This work was executed in collaboration with a Canadian company, Bioxy AFD, in Quebec, and highlights safe application of a novel formulation generating per-acetic acid and peroxide at neutral pH. Two unique benefits of using this technology include significantly reduced burden for storage and shipment (produced as dry powder), and high material compatibility because of its effectiveness at neutral pH and reduced corrosion at working concentrations of 2-5%. The dry powder has over three years of shelf life, and can be stored under ambient conditions.
- **Journal article published:** "Tuning the Morphology and Activity of Polystyrene/Uio-66-NH₂ Metal-Organic Framework Composites to Enhance Chemical Warfare Agent Removal", authored by Gregory Peterson (ECBC), Annie Lu, Ph.D., (DTRA, ECBC matrixed), and Thomas Epps (University of Delaware), was published in ACS Applied Materials & Interfaces. The work was completed under the ECBC In-House Laboratory Independent Research (ILIR) Program, and focuses on selective deposition of metal-organic frameworks (MOFs) into or onto fibers using electrospinning techniques. The selective deposition of MOFs integrated into fiber systems has direct implications on protective suits and filters, both of which are being investigated by the CBR Filtration Branch. The paper can be accessed at: <http://pubs.acs.org/doi/abs/10.1021/acsami.7b09209>
- **ECBC Smoke and Target Defeat Branch and The Missile and Space Intelligence Center** conducted a field test to quantify obscurant performance in defeating anti-tank guided missiles (ATGMs) for use as a soft kill countermeasure in a modular active protection system. The test was conducted at the Redstone Test Center in Huntsville, Alabama August 7-24 2017. The test was a simulated engagement, using actual threat systems; no missiles were dynamically fired. The obscurants used during these trials were fog oil, graphite, and red phosphorus. The obscurants were deployed in the line of sight of four threat ATGM systems at two ranges. Obscurant interference to the missile guidance/tracking system was recorded for later analysis. A total of 523 trial engagements were conducted during this test. Other organizations involved in the testing include: The National Ground Intelligence Center, The Army Aviation and Missile Research, Development and Engineering Center, The Communications-Electronics Research, Development and Engineering Center, The Tank Automotive Research, Development and Engineering Center, The Project Manager for Aircraft Survivability Equipment, Georgia Tech Research Institute, Science and Technology Corporation, Parsons, Defence Science and Technology Laboratory, and The Redstone Test Center. 🌱

R&T STAFF NEWS

New Hires

- **Mr. Shawn Hannigan**, Administrative Support Assistant
- **Ms. Kimberly Berk**, Biologist, assigned to the BioSensors Branch
- **Mr. Kevin Morrissey**, Supervisory Chemist, assigned as Decontamination Sciences Branch Chief
- **Dr. Kelly Basi**, Supervisory Biologist, assigned as BioDefense Branch Chief
- **Dr. Charles Asowata**, Supervisory Biologist, assigned as BioTesting Division Chief
- **Dr. C. Nicole Rosenzweig**, Supervisory Biologist, assigned as BioSciences Division Chief
- **Mr. Zachary Smedley**, Chemical Engineer, assigned to Directorate Office
- **Mr. Ian Pardoe**, Chemist, assigned to Chemical Analysis & Physical Properties Branch
- **Dr. Monica McEntee**, Chemist, assigned to CBR Filtration Branch
- **Mr. Justin Curtiss**, Chemist, assigned to Chemical Analysis and Physical Properties Branch
- **Dr. Angela Zeigler**, Chemist, assigned to SS&AT Branch
- **Mr. Daniel Deford**, IT Spec, assigned to NBC Battlefield Integration Branch

Promotions

- **Dr. Calvin Chue**, Supervisory Biologist, promoted to Chief BioChemistry Branch
- **Dr. Michael Feasel**, Research Toxicologist
- **Dr. Jeffery Hogan**, Supervisory Biologist, promoted to Chief Aerobiology Branch
- **Mr. Aaron Thomas**, Supervisory Biologist, promoted to Chief Microbiology Branch
- **Dr. Brian Bennett**, Supervisory Biologist, promoted to Deputy of BioTesting Division
- **Dr. Matthew Lux**, Research Biologist
- **Dr. Linnzi Wright**, Research Toxicologist
- **Mr. Giancarlo Diviacchi**, Chemical Engineer
- **Ms. Ameer Polk**, Chemical Engineer

These new hires and promotions are effective from May-October 2017.

TECHNICAL REPORTS

TR-1452 - Signaling Pathways Associated with VX Exposure in Mesenchymal Stem Cells. Authors: Daniel Angelini, Christopher Phillips, Amber Prugh, Trevor Glaros, Gao Tran. Distribution A

TR-1478 - Evaporation and Degradation of a Sessile Droplet of VX on an Impermeable Surface. Authors: Mark J. Varady, Patrick C. Riley, Brent A. Mantooth, Amanda M. Schenning, Janet C. Fouse, Thomas P. Pearl. Distribution A

TR-1397 - Extraction and Analysis of Non-Traditional Agents from Various Food Matrices by Liquid Chromatography-Time-of-Flight Mass Spectrometry Authors: Sue Bae and Mark Winemiller. Distribution C

TR-1407 - U.S. Department of Transportation (DOT) Inhalation Test of Neutralized EA 6033 Hydrolysate in Sprague Dawley Rats Authors: William Muse, Richard Lawrence, Dennis Miller, Charles Crouse, Edward Emm. Distribution D

TR-1460 - Mass Spectrometry Proteomics Method as a Rapid Screening Tool for Bacterial Contamination of Food. Authors: Rabih Jabbour (ECBC), Karyn Havas (USDA), Mary Wade (ECBC), Samir Deshpande (STC), Patrick McCubbin (Optimetrix), Candelaria Daniels and Bernardo Delgado (USAPHC-South). Distribution A

TR-1465 - GC-MS/MS Analyses of Biological Samples in Support of Evaluation of Toxicity Associated with Intravenous Exposure to VX Stereoisomers in Guinea Pigs. Authors: Jeffrey McGuire, Linnzi Wright, Robert Kristovich (ECBC) and Michael Busch (Excet). Distribution A

TR-1466 - Surety Hood Culture of Plants for Agent-Plant Investigations. Authors: Ronald Checkai, Michael Simini, Mark Haley. Distribution A

TR-1446 - Replacement of Sulfur in the Red and Violet M18 Smoke Formulations. Authors: Giancarlo Diviacchi, Joseph Domanico, Joseph May (ECBC) and Gretel Raibeck (ARDEC). Distribution C

TR-1472 - Chemical Depth-Profiling in Coatings Using Scanning Electron Microscopy and Energy Dispersive Spectroscopy Authors: Brent Mantooth, Mark Varady (ECBC), Thomas Pearl and Kayla Cooley (DCS). Distribution C

THE MURI TEAM CREATES NEW LOW-LOSS AND LOWER-COST NANOPARTICLES AND NANOCOMPLEXES



Naomi Halas, Ph.D., founding director of the Laboratory for Nanoparticles at Rice University, briefed ECBC staff on the MURI project results.

The final phase of a five-year MURI entitled “Coherent Effects in Hybrid Nanostructures for Lineshape Engineering of Electromagnetic Media,” came to a close at ECBC. Augustus W. Fountain, III, Ph.D., ECBC R&T Senior Research Scientist for Chemistry, along with the Army MURI Program Director, Dawanne Poree, Ph.D., who also serves as the Army Research Office Program Manager, hosted the final, annual review of this MURI program. The research team, led by Naomi Halas, Ph.D., founding director of the Laboratory for Nanoparticles at Rice University, briefed Department of Defense (DoD) representatives and ECBC staff on the project’s results and accomplishments.

This project was one of eight selected for funding under the FY12 Metamaterials MURI, and was part of the Army portion of the tri-service DoD MURI program. The MURI program was established by the DoD to make advances in research areas that require multidisciplinary approaches; funding research that intersects more than one traditional science and engineering discipline. Evaluations of MURI proposals are held according to a rigorous peer review process, with selected projects typically funded at \$1M per year for three to five years.

The research objective of this MURI effort was to develop a fundamental understanding of nanomaterials to control the propagation of electromagnetic (EM) energy, with an emphasis on designing and investigating materials that possess broad spectrum absorption with a narrow, selective window of EM transmission. Using a combination of computational, characterization, and nanoscale fabrication techniques to tailor EM properties for materials in specific, selected regions of the spectrum, the MURI research team focused on designing, synthesizing, and combining nanoparticles and nanoparticle-based complexes to yield nanocomplexes exhibiting optimized coherent effects. Their collaborative studies resulted in

the development of new, low-loss, lower-cost, benign metallic and semiconductor nanoparticles and nanocomplexes.

Since the project’s initiation in FY12, Halas and the research team have developed new and innovative approaches to existing technologies for the DoD, including an aerosol scatterer with one, or more, transparency windows. Ultimately, this research has enabled the design of materials with positioned transparency or absorptivity windows which may impact Army applications in broadband scattering absorption. Continued research on this topic is expected to yield multiple applications for linewidth-engineering media, as well as defense-related and commercial products such as roll-to-roll processing and paint-on metamaterials.

“[This] MURI [project] was comprised of a dynamic team, who had a clear vision and outstanding communication,” explained Halas. “Ultimately, [this] MURI [team] emphasized the next generation of scientists who are on the leading-edge of technical approaches, willing to generate new concepts and make them even better.”

Looking to the future, Poree suggested the possibility of funding a follow-on year for this work via a non-MURI mechanism. ▲

Project Collaborators:

- **Uwe Kortshagen**, Ph.D., University of Minnesota Department of Mechanical Engineering
- **Nicholas Kotov**, Ph.D., University of Michigan Department of Engineering
- **Alexander Govorov**, Ph.D., Ohio University Department of Physics & Astronomy
- **Chris Hogan**, Ph.D., University of Minnesota Department of Mechanical Engineering
- **Stephan Link**, Ph.D., Rice University Department of Chemistry
- **Peter Nordlander**, Ph.D., Rice University Department of Physics & Astronomy
- **Naomi Halas**, Ph.D., Rice University Department of Electrical & Computer Engineering
- **Ashok Veeraraghavan**, Ph.D., Rice University Department of Electrical & Computer Engineering

Edgewood Chemical Biological Center



WHO WE ARE. WHAT WE DO.

OUR MISSION

Combat global Chemical and Biological threats through innovative research

WHAT WE ASPIRE TO BE.

OUR VISION

To be the World-Class leader for innovative research combating Chemical and Biological threats



WORKFORCE

Develop an engaged and effective workforce



CAPABILITIES

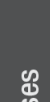
Reinforce and diversify key capability sets



CUSTOMERS

Attract and maintain a variety of customers

OBJECTIVES



EXCELLENCE • INTEGRITY • CREATIVITY • COLLABORATION • SAFETY • SERVICE